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EP 0025228 A1 US 4414705 A US 3289877 A

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UK CL (Edition J) B8T TWC, E2F FCP
INT CL⁴ B65D, E05D

(54) Hinged devices

(57) A hinged device such as a closure for a container with a first hinge member (2) hinged to a second hinge member (3) through a flexible web (4) defining a first hinge axis, and a flexibly resilient link (7) connecting the first and second hinge members and providing by a toggle action the hinged members with first and second at-rest-positions on either side of an intermediate position is characterised in that the link has two flexing axes (7a, 7b) spaced from its ends and parallel to the first hinge axis permitting said link to resiliently flex in opposite directions. The second at-rest-position is shown while in the first at-rest-position the link lies to the left of the hinge web (4) but the member (2) is still in a raised position to indicate that the orifice (6) has not been sealed and the member (2) must be moved further to the closed position.

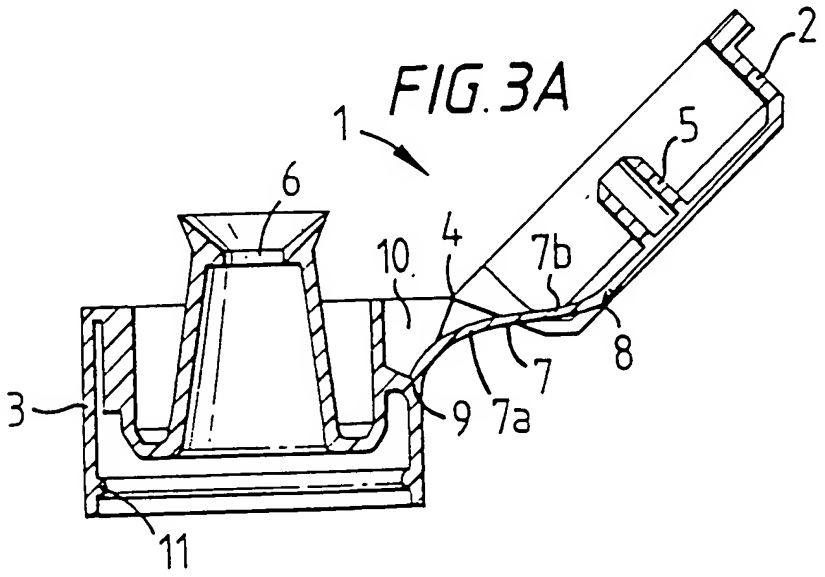

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FIG.1

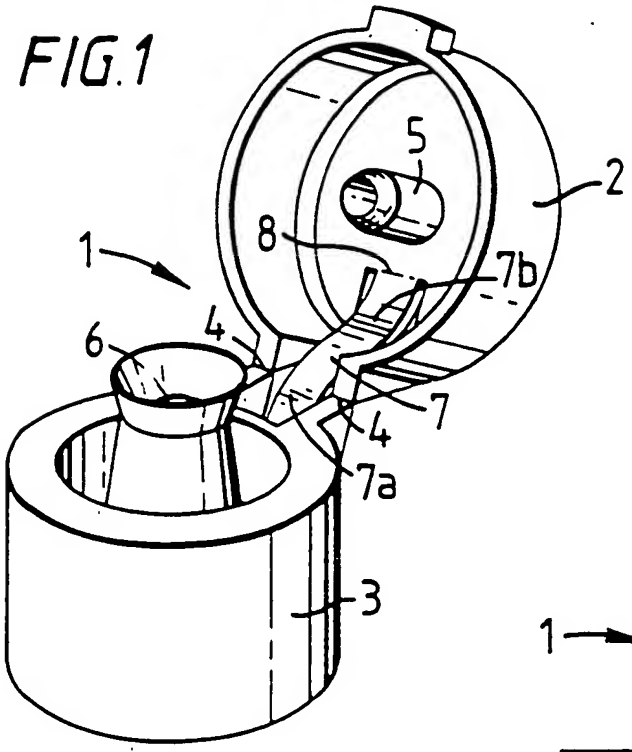


FIG.2

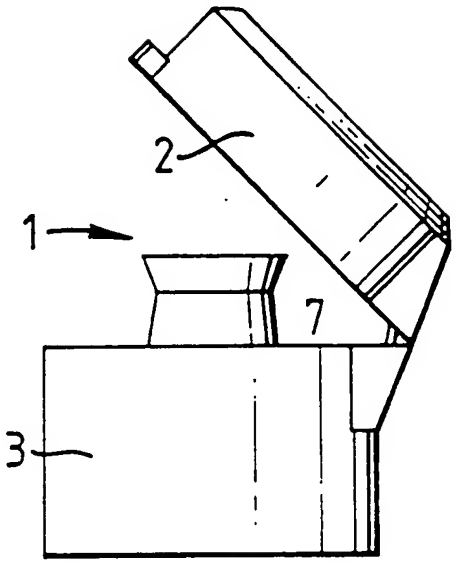


FIG.3

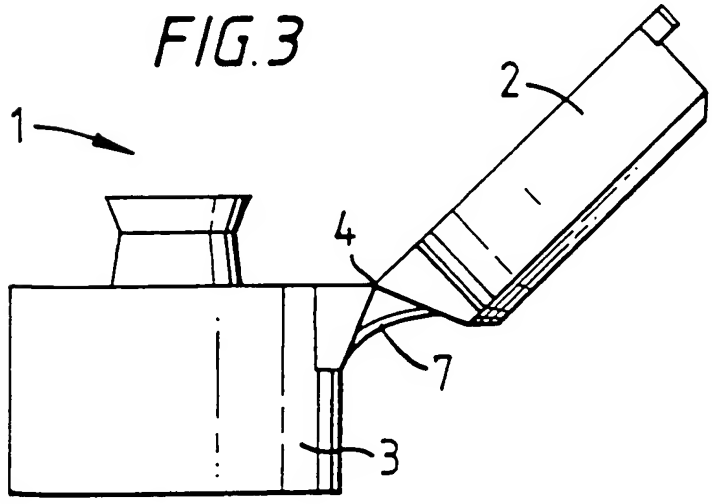


FIG. 2A

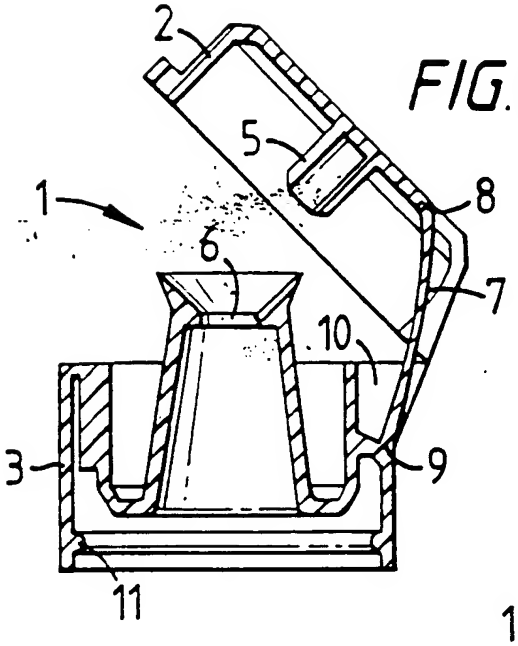


FIG. 3A

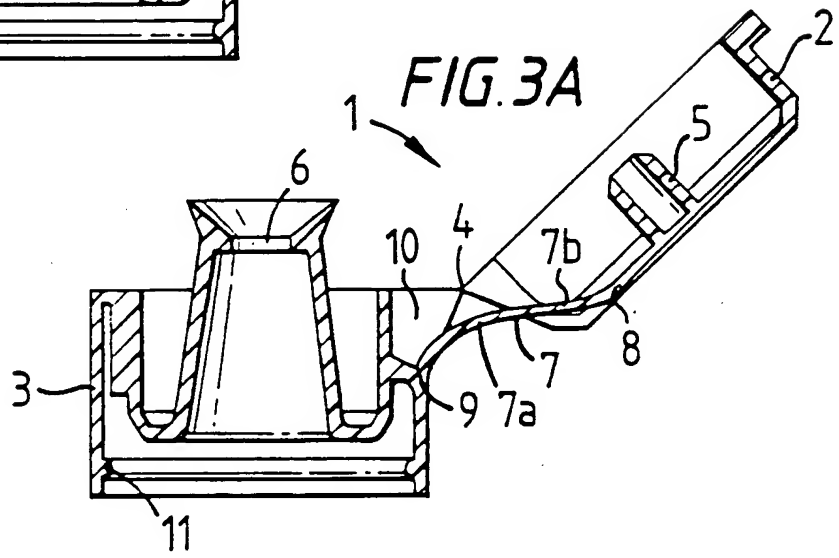


FIG. 4

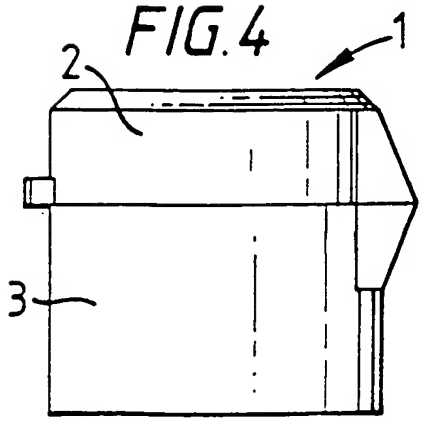
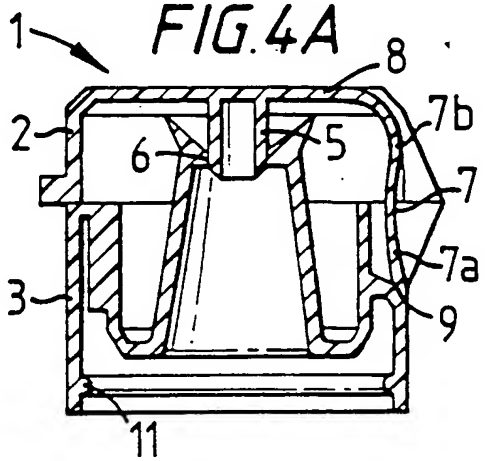


FIG. 4A



HINGED DEVICES

This invention relates to hinged devices and particularly but not exclusively to hinged devices as applied to dispensing closures.

It has been known for many years to mould plastics components which are mutually hinged through an integrally moulded section which for example may be in the form of a flexible strap or in the form of a so-called living hinge.

While any plastics material from which a flexible moulded section may be formed may be suitable, for the latter type of hinge where repeated stressing across a hinge line occurs on operation of the hinge, the durability of the hinge can be usefully enhanced by employing an orientable plastics material whereby the molecules of the plastic may be oriented transversely to the hinge line. Such orientation may be achieved during moulding or it may be effected at least in part on first operation of the hinge.

In the field of plastics closures for containers and particularly plastics closures having a dispensing orifice closable by a cap, it is desirable to arrange for the cap to be attached, particularly to the closure itself, to avoid it being mislaid. However, unless provision is made for the cap to be locked in a suitably remote position it can interfere with the dispensing operation.

In order to provide such locking, many devices have been proposed whereby the two components are hinged together via a

living hinge in cooperation with a flexibly resilient strap being itself hinged at both ends and providing a spring toggle effect.

In operating the thus formed toggle hinge from a first at rest position, stress in the strap is increased thereby tending to restore the components to the first at rest position until a position of maximum stress is reached and beyond which the stress tends to cause the two components to take up a second at-rest position.

Generally, the at-rest positions in dispensing closure systems correspond to the cap being in the substantially closed or in the locked back position.In general also the closed position of the cap is achieved via a snap fastener aimed to positively secure the cap down while at the same time providing a seal against egress of any container contents via the dispensing orifice during transit.

Dispensing closures of the above type have been extensively used for some long time but there have been certain draw-backs to their use. In particular, when the closures are applied to containers it is not readily evident that a cap is not fully secured down to provide the required seal. Accordingly, filled bottles can leave a factory with caps unsecured with obviously undesirable results. Secondly, one-handed operation of the cap from its substantially closed position to its locked back position requires a high level of dexterity.

According to the present invention there is provided a hinged device comprising a first hinge member hinged to a second hinge member through at least one flexible web defining a first hinge axis, and a flexibly resilient link integrally connected at one end to the first hinge member and at the other end to the second hinge member, said integral connections providing the hinged members with a first at-rest-position and a second at-rest-position respectively on either side of an intermediate position longitudinally

stressing to a maximum position the flexibly resilient link, characterised in that the flexibly resilient link has two flexing axes spaced from its ends and parallel to the first hinge axis permitting said link to resiliently flex in opposite directions along the said flexing axes such flexing being predominantly along at least one of said flexing axes when the hinge members are moved from the second at-rest position to a fully closed position whereby one hinge member traverses through the first at-rest position.

According to a preferred embodiment of this invention, the angle through which the two hinge members must be moved relative to one another to pass from the first at-rest position to the second at-rest position is less than 135°, preferably less than 110°, more preferably less than 90°.

It is preferred that the angle between the hinge members when in the second at-rest position lies in the range of 90° to 180° more preferably 110° to 160° most preferably in the region of 135°.

The hinged device of this invention may comprise any device wherein it is desirable for the hinging of two members to be such that there are two at-rest positions on either side of an intermediate position towards one or other of which the members are urged.

While the range of such devices is vast and may extend to hinged devices for attachment to various articles to provide hinging between two members such as hinges which may be fixed to container lids, doors, flaps and the like, they are ideally suited, when moulded of plastics material, to being intergrally moulded with the components to be ultimately hinged.

Thus in the above examples, the hinged devices of this invention may be integrally moulded with the container lids, doors, flaps and similarly hingeable articles.

The hinged devices of this invention find particular utility in container closures. In this connection, there is a

particular need for dispensing closures incorporating closure caps wherein the angle through which the cap must be moved from one at-rest-position to the other at-rest-position can be less than 135° in order to resiliently lock the cap in a position where interference with dispensing is avoided.

The flexible web defining the first hinge axis may be any web having a thickness suitable to provide a hinge axis. Advanteously, the web may be a moulded connecting element, between the two hinge members, which may be thinner than the surrounding members. Thinning may be a result of the moulding process or may be effected after the moulding process by a subsequent moulding step or it may be effected by moving the two hinge members in a hinging fashion, after moulding, to stretch and thin the connecting element or by a combination of these and/or like techniques.

A technique which, when applied, will orient molecules of the connecting element in a direction transverse to the first hinge axis can introduce increased durability to a plastics hinge as indicated earlier.

It is preferred that there are at least two flexible webs which together define the first hinge axis.

The flexibly resilient link integrally connected at one end to the first hinge member and at the other end to the second hinge member may be a strap-like member and it is advantageously integrally moulded with the hinge members and preferably comprises the same material as that of the hinge members, such as a thermoplastics material. However, if required, a reinforcing material such as a metal strip may be incorporated.

In order to reduce the number of manufacturing operations involved, the link is, for example, directly formed in an injection moulding operation substantially in the shape it is required to take when the hinge members are in one or other of the at-rest-positions preferably the second at-rest position. However, the manner of shaping the link may be dictated by,

for example, the nature of the hinge members and of the manufacturing operation employed.

The link is preferably shaped to provide two flexing axes spaced from its ends permitting it to resiliently flex in opposing directions along the said flexing axes. Thus the link may be provided along its length with two notches, grooves or indentations suitably spaced from each other. Alternatively, or additionally, the link may be provided with a wave-like profile, e.g. an S-shape, providing it with concave surfaces thereby urging the alternate two-way flexing. Other such expedient shapes will suggest themselves to the skilled addressee.

To urge the link to flex appropriately, it may be advantageous for its integral connection to either or both hinge members to be rigid or at least relatively rigid with respect to the link and thereby permitting some resilient movement between the link and the hinge member. When only one end is so connected, the other end may be hingedly connected by, for example, a flexible web of the type hereinbefore described, with the web hinge axis parallel to the first hinge axes.

The connections of the link to the hinge members are preferably so positioned that movement of the hinge members from one at-rest-position to the other at-rest-position causes the link to be longitudinally stressed to a maximum position as its mean central plane passes through the line of the first hinge axis.

The mean central plane of the link is that plane passing through the lines of integral connection of the link to the hinge members.

In order to provide the hinged device of this invention with durability at minimum manufacturing cost, it is preferably produced as a single unitary moulding of thermoplastics material.

Thermoplastics which may be employed in the manufacture

of the hinged devices of this invention include polyolefins such as high, medium or low density ethylene polymers, including linear and branched polymers, propylene polymers, polyethylene terephthalates, polycarbonate and vinyl chloride polymers. However, polypropylene is preferred.

The novel hinged devices of this invention find particularly advantageous application in the manufacture of dispensing closures with captive sprung caps since the angle through which the cap need be moved from one at-rest-position to the other can be made small rendering it an operation more easily effected using one hand. Further, the hinged devices may be neat in their construction and be given smooth lines to improve hygienic aspects.

Still further, the reduced movement that can be achieved between the at-rest-positions enables dispensing closures to be produced wherein both at-rest-positions are such that an unsecured cap is evidently up-standing and is therefore immediately detected.

The present invention will now be described with reference to the attached drawings by way of example only and such description should not be construed as limiting the scope of this invention.

Figure 1 shows a hinged device according to this invention comprising a dispensing closure incorporating a sprung cap.

Figure 2 shows the closure of Figure 1 with the cap in first at-rest position.

Figure 2A is a mid cross section of figure 2.

Figure 3 shows the closure of Figure 1 with the cap in a second at-rest-position.

Figure 3A is a mid cross-section of the closure of Figure 3.

Figure 4 shows the closure of Figure 1 with the cap in the finally closed position.

Figure 4A is a mid cross-section of the closure of Figure 4.

In the drawings like numerals indicate like parts. 1 indicates generally a dispensing closure injection moulded from polypropylene with captive cap 2 hinged to base 3 through flexible webs 4 forming a hinge axis running there-through.

The closure is provided with means whereby it may be fitted to a container neck. Such means may comprise known screw thread, plug or snap-on fitting for example. Bead 11 shown in the drawings provides for snap-on fitting.

The cap is provided with spigot 5 adapted to fit into dispensing aperture 6 when the cap is in its closed position to simultaneously secure the cap down and to seal the aperture in known fashion.

Integrally moulded flexibly resilient link 7 in the shape of a shallow "S" having flexing axes 7a and 7b is connected at one end to the cap at 8 in semi-rigid resilient integral manner and at its other end to the external wall of the base 3 at point 9. The points of connection 8 and 9 being situated so that on moving the cap from the position shown in Fig 2 to the position shown in Fig 3 the centre plane as herein before defined of the link 7 passes through the axis formed by webs 4. When the cap is in a position whereby the centre plane of link 7 is in line with said axis the forces acting by way of the longitudinally stressed link tending to urge the cap 2 into one or other of the at-rest-positions are essentially equally distributed and may be considered balanced. However, it is not normally possible to maintain such a balance and the cap will spring towards one or other of the at-rest positions and will not remain in the intermediate position. Stressing of the link occurs by way of being stretched by flexing along at least one of the flexing axes, the resilience of the link tending to restore it to its unstressed shallow S-shape. The connection at point 9 is by way of a line hinge whereby the link 7 may move towards and away from the wall of 3 as best

seen by looking at Figures 2A and 3A.

It will be seen that in Fig 3A space 10 exists between the wall of 3 and link 7 whereas in Fig 2A this space is reduced. This manner of positioning and hinging the end of link 7 at 9 provides for resiliently flexing the link along the flexing axis 7b through further lowering and closure of the cap which can only be achieved by overcoming the restoring forces. Accordingly, unless the spigot 5 is properly located in orifice 6 in secured fashion the restoring forces in link 7 raise the cap to the first at-rest-position. Thus, a closure having an unsealed orifice will be readily evident from the up-standing cap. Further, it will be appreciated from figures 3A and 4A that flexing of link 7 will be predominantly along flexing axis 7a and then alternately predominantly along flexing axis 7b when the cap is moved from the position shown in Figure 3A to that shown in figure 4A.

In an alternative embodiment of this invention the position of wall 3 is such that in moving cap 2 from the first at-rest position to the fully closed and secured position the link 7 is resiliently flexed over the top edge of wall 3. In such alternative embodiment the flexing axis 7b is correspondingly positioned.

It will be evident that a cap in the fully closed position can readily be raised to the first at-rest position.

Once in the first at-rest-position it is then a simple operation to move the cap to the secondat-rest-position in which the cap is resiliently locked back to permit unobstructed dispensing through the orifice. This two stage opening renders one hand operation much easier than if it was necessary to achieve movement of the cap from a substantially fully closed position to the second at-rest-position in a single operation.

Variations on the embodiments described will be evident to the skilled addressee having now described the invention and which will not depart from the spirit thereof.

Figure 4A is a mid cross-section of the closure of Figure 4.

In the drawings like numerals indicate like parts. 1 indicates generally a dispensing closure injection moulded from polypropylene with captive cap 2 hinged to base 3 through flexible webs 4 forming a hinge axis running there-through.

The closure is provided with means whereby it may be fitted to a container neck. Such means may comprise known screw thread, plug or snap-on fitting for example. Bead 11 shown in the drawings provides for snap-on fitting.

The cap is provided with spigot 5 adapted to fit into dispensing aperture 6 when the cap is in its closed position to simultaneously secure the cap down and to seal the aperture in known fashion.

Integrally moulded flexibly resilient link 7 in the shape of a shallow "S" having flexing axes 7a and 7b is connected at one end to the cap at 8 in semi-rigid resilient integral manner and at its other end to the external wall of the base 3 at point 9. The points of connection 8 and 9 being situated so that on moving the cap from the position shown in Fig 2 to the position shown in Fig 3 the centre plane as herein before defined of the link 7 passes through the axis formed by webs 4. When the cap is in a position whereby the centre plane of link 7 is in line with said axis the forces acting by way of the longitudinally stressed link tending to urge the cap 2 into one or other of the at-rest-positions are essentially equally distributed and may be considered balanced. However, it is not normally possible to maintain such a balance and the cap will spring towards one or other of the at-rest positions and will not remain in the intermediate position. Stressing of the link occurs by way of being stretched by flexing along at least one of the flexing axes, the resilience of the link tending to restore it to its unstressed shallow S-shape. The connection at point 9 is by way of a line hinge whereby the link 7 may move towards and away from the wall of 3 as best

seen by looking at Figures 2A and 3A.

It will be seen that in Fig 3A space 10 exists between the wall of 3 and link 7 whereas in Fig 2A this space is reduced. This manner of positioning and hinging the end of link 7 at 9 provides for resiliently flexing the link along the flexing axis 7b through further lowering and closure of the cap which can only be achieved by overcoming the restoring forces. Accordingly, unless the spigot 5 is properly located in orifice 6 in secured fashion the restoring forces in link 7 raise the cap to the first at-rest-position. Thus, a closure having an unsealed orifice will be readily evident from the up-standing cap. Further, it will be appreciated from figures 3A and 4A that flexing of link 7 will be predominantly along flexing axis 7a and then alternately predominantly along flexing axis 7b when the cap is moved from the position shown in Figure 3A to that shown in figure 4A.

In an alternative embodiment of this invention the position of wall 3 is such that in moving cap 2 from the first at-rest position to the fully closed and secured position the link 7 is resiliently flexed over the top edge of wall 3. In such alternative embodiment the flexing axis 7b is correspondingly positioned.

It will be evident that a cap in the fully closed position can readily be raised to the first at-rest position.

Once in the first at-rest-position it is then a simple operation to move the cap to the secondat-rest-position in which the cap is resiliently locked back to permit unobstructed dispensing through the orifice. This two stage opening renders one hand operation much easier than if it was necessary to achieve movement of the cap from a substantially fully closed position to the second at-rest-position in a single operation.

Variations on the embodiments described will be evident to the skilled addressee having now described the invention and which will not depart from the spirit thereof.

Figure 4A is a mid cross-section of the closure of Figure 4.

In the drawings like numerals indicate like parts. 1 indicates generally a dispensing closure injection moulded from polypropylene with captive cap 2 hinged to base 3 through flexible webs 4 forming a hinge axis running there-through.

The closure is provided with means whereby it may be fitted to a container neck. Such means may comprise known screw thread, plug or snap-on fitting for example. Bead 11 shown in the drawings provides for snap-on fitting.

The cap is provided with spigot 5 adapted to fit into dispensing aperture 6 when the cap is in its closed position to simultaneously secure the cap down and to seal the aperture in known fashion.

Integrally moulded flexibly resilient link 7 in the shape of a shallow "S" having flexing axes 7a and 7b is connected at one end to the cap at 8 in semi-rigid resilient integral manner and at its other end to the external wall of the base 3 at point 9. The points of connection 8 and 9 being situated so that on moving the cap from the position shown in Fig 2 to the position shown in Fig 3 the centre plane as herein before defined of the link 7 passes through the axis formed by webs 4. When the cap is in a position whereby the centre plane of link 7 is in line with said axis the forces acting by way of the longitudinally stressed link tending to urge the cap 2 into one or other of the at-rest-positions are essentially equally distributed and may be considered balanced. However, it is not normally possible to maintain such a balance and the cap will spring towards one or other of the at-rest positions and will not remain in the intermediate position. Stressing of the link occurs by way of being stretched by flexing along at least one of the flexing axes, the resilience of the link tending to restore it to its unstressed shallow S-shape. The connection at point 9 is by way of a line hinge whereby the link 7 may move towards and away from the wall of 3 as best

seen by looking at Figures 2A and 3A.

It will be seen that in Fig 3A space 10 exists between the wall of 3 and link 7 whereas in Fig 2A this space is reduced. This manner of positioning and hinging the end of link 7 at 9 provides for resiliently flexing the link along the flexing axis 7b through further lowering and closure of the cap which can only be achieved by overcoming the restoring forces. Accordingly, unless the spigot 5 is properly located in orifice 6 in secured fashion the restoring forces in link 7 raise the cap to the first at-rest-position. Thus, a closure having an unsealed orifice will be readily evident from the up-standing cap. Further, it will be appreciated from figures 3A and 4A that flexing of link 7 will be predominantly along flexing axis 7a and then alternately predominantly along flexing axis 7b when the cap is moved from the position shown in Figure 3A to that shown in figure 4A.

In an alternative embodiment of this invention the position of wall 3 is such that in moving cap 2 from the first at-rest position to the fully closed and secured position the link 7 is resiliently flexed over the top edge of wall 3. In such alternative embodiment the flexing axis 7b is correspondingly positioned.

It will be evident that a cap in the fully closed position can readily be raised to the first at-rest position.

Once in the first at-rest-position it is then a simple operation to move the cap to the secondat-rest-position in which the cap is resiliently locked back to permit unobstructed dispensing through the orifice. This two stage opening renders one hand operation much easier than if it was necessary to achieve movement of the cap from a substantially fully closed position to the second at-rest-position in a single operation.

Variations on the embodiments described will be evident to the skilled addressee having now described the invention and which will not depart from the spirit thereof.

CLAIMS

1. A hinged device comprising a first hinge member hinged to a second hinge member through at least one flexible web defining a first hinge axis and a flexibly resilient link integrally connected at one end to the first hinge member and at the other end to the second hinge member, said integral connections being spaced from said first hinge axis and said flexibly resilient link tending to maintain its two ends at a constant distance apart to provide the hinged members with a first at-rest-position and a second at-rest-position respectively on either side of an intermediate position longitudinally stressing to a maximum position the flexibly resilient link, characterised in that the flexibly resilient link has two flexing axes spaced from its ends and parallel to the first hinge axis permitting said link to resiliently flex in opposite directions along the said flexing axes such flexing being predominantly along at least one of said flexing axes when the hinge members are moved from the second at-rest position to a fully closed position whereby one hinge member traverses through the first at-rest position.

2. A hinged device as claimed in claim 1 wherein the angle through which the two hinge members must be moved relative to one another to pass from the first at-rest position to the second at-rest position is less than 135° preferably less than 110°,more preferably less than 90°.

3. A hinged device as claimed in either claim 1 or claim 2

wherein the angle between the hinge members when in the second at-rest position lies in the range of 90°-180°, preferably 110°-160° more preferably in the region 135°.

4. A hinged device as claimed in any one of the previous claims wherein there are two flexible webs which together define the first hinge axis.

5. A hinged device as claimed in any one of the previous claims wherein the flexibly resilient link is connected at one end to the first hinge member and at the other end to the second hinge member such that the link is longitudinally stressed to a maximum position as its mean centre plane as herein before defined passes through the line of the first hinge axis when the hinge members are moved from one at-rest-position to the other at-rest-position.

6. A hinged device as claimed in any one of the previous claims wherein the link is provided with two flexing axes spaced from its ends by shaping.

7. A hinged device as claimed in claim 6 wherein the link is provided along its length with two notches, grooves or indentations spaced from each other.

8. A hinged device as claimed in claim 6 wherein the link has a wave-like profile providing it with concave surfaces.

9. A hinged device as claimed in any one of the previous claims wherein at least one of the connections of the link to the hinge members is rigid or relatively rigid with respect to the link.

10. A hinged device as claimed in any one of the previous claims wherein movement of the hinge members towards one another through the first at-rest position stresses the link which tends to restore the hinge members to the said first at-rest-position.

11. A hinged device as claimed in any one of the previous claims wherein the first at-rest position is controlled by means capable of resiliently stopping the hinge members from reaching their closest position to one another in which the link would be in a substantially unstressed state under restoring forces

within the link.

12. A hinged device as claimed in any one of the previous claims comprising the two hinge members which are a dispensing closure and a cap formed as a unitary plastics moulding.

13. A hinged device as claimed in claim 12 moulded from polypropylene.

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